RIES d'ASPROBIO AGM

Revue internationale environnementale semestrielle / Biannual international environmental review

Association pour la protection de la biodiversité et adoption de gestes marqueurs

RIES -issue 1- November 2020

ISSN -in progress

Director of publication: Sabine NDZENGUE AMOA

RIES d'ASPROBIO AGM

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RIES -issue 1- November 2020

ISSN -in progress

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ISSN -in progress

Editorial :

ASPROBIO AGM, *association pour la protection de la biodiversité et adoption de gestes marqueurs* was born on January 10, 2018, the date of the declaration in the prefecture of Evry.

Various workshops and projects have been carried out to raise awareness among as many people as possible about the protection of biodiversity and climate change. But we lacked a way important to inform as many people as possible.

The RIES is here!!!!! to inform every six months about the highlights of the environmental news.

Happy reading to all !!!

Thierry Noël,
Vice-president ASPROBIO AGM

RIES -issue 1- November 2020
ISSN -in progress

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RIES d'ASPROBIO AGM

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ISSN -in progress

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ISSN -in progress

Participatory science strengthens community-based climate change communication services in East Africa

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Summary

This article presents the effectiveness of participatory science in community sensitization for research to improve resilience to climate change in East Africa. It is ethically crucial to create an effective participatory science communication strategy to ensure the dissemination of innovation. In this review, the document details the adverse consequences of

the effects of climate change in Africa, the efforts to be made by the sub-region, the common barriers, the national and regional responses. The impacts of climate change have enormous social, economic, political and environmental loss and damage in Africa. It is imperative to plan national, sub-regional and regional strategies for climate change mitigation and adaptation, and to develop an effective citizen science policy strategy. East Africa is already facing grim social, economic, political and environmental impacts of climate change-related risks. The main points are to: strengthen the database to help climate change research, raise awareness of climate change mitigation and adaptation, improve gender mainstreaming, reduce gas emissions, technology transfer, communication strategy, theory, ethics, and to develop collaborative research.

Keywords: participatory science, communication, dissemination, climate change, climate services, Africa

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Introduction

Innovative participatory science in community outreach for research and policy information dissemination enhances achievements in climate change mitigation and adaptation implementation by 2030 in Africa.

Levels of community awareness on the benefits of citizen science and information on

innovation policies still leave something to be desired. Low levels of awareness of climate change adaptation and mitigation strategies are a huge setback to the process of implementing the 13th SDG. Surveys have revealed low public awareness in Uganda about the possibilities and benefits of integration in East Africa (Eyotaru, 2013). Uganda has determined that participatory science in sensitizing the climate change community manifests these extreme climatic events: drought, high temperatures, heavy rains, hailstorms, floods and landslides. The sub-regional body has developed a framework to put in place an effective sub-regional policy on climate change.

Communication on climate change policies should be designed to reflect the following context: climate change risks and disasters have continued to demand serious incidents of social, economic, environmental, political and legal challenges at local levels , national, regional and global. The risks of disasters linked to climate change are more serious in the sub-region and throughout Africa. This continent is the most vulnerable to the adverse effects and damage caused by climate change.

Participatory science intervenes in:

• Community outreach for research and dissemination policy information in the context of mass poverty,

• Low awareness of the adaptation strategy;

• The cancerous corruption of the state,

• The agricultural regime fed by the rain and dominated by the peasantry,

• High vulnerability to disasters linked to climate change ;

• Low awareness and access to information, and

• Weak research on the risks of disasters linked to climate change.

In addition, increasing natural disasters like droughts, floods and landslides are among the major climate change risks in the region (GoT, 2006, 2012), including: sea level rise This also leads to the destruction of infrastructure along the coasts, submergence of small islands in the Indian Ocean, salt water intrusion, contamination of fresh water wells along the coasts, beach erosion, creeping floods , and droughts among others.

I- Climate Change Communication Services

The objectives of participatory science in community outreach for research and dissemination of policy information are:

 Evaluate the effectiveness of regional communication to raise awareness of climate change adaptation and mitigation policies;

 Establish the communication channels of the information used and the reach of the messages (exposure to the audience);

 Public participation in designing messages;

Identify the challenges in developing an effective communication strategy for the timely implementation of the National Action Plan for Climate Change Adaptation and explain the effectiveness of evaluating communication campaigns public.

For example, climate policy communication can use different communication approaches such as myth busting, new thinking, audience principles, style principles, and better management according to these methods:

- **Targets**
- **Branding and key**
- **Posts**
- **Public relations**
- **Seasonality**
- **Use of different channels**
- **Television and radio**
- **Printed materials**
- **Electronic media**
- **Support for stakeholder engagement**
- **Direct engagement**
- **Advertising**
- **Community sensitizations**
- **Field demonstration centers**
- **Social media (social networking)**
- **Community (citizen journalism)**
- **Youth clubs. Volunteers (volunteering).**

Participatory science in community research on advocacy and policy information in the sub-region is a work in progress. With endemic poverty, weak institutional capacity, lack of skills in climate change adaptation and mitigation, insufficient skills in disaster management, lack of technology, insufficient funds and economic dependence on with regard to natural resources; East Africans are already vulnerable to the adverse effects of climate change. Adverse weather conditions will continue to wipe out agricultural production, leading to higher food prices, lower domestic prices and a deterioration in export trade. Most citizens are unaware of green energy technologies as clean and affordable alternative energy sources. The lack of awareness of climate change issues requires participatory science based on a communication strategy based on environmental conventions on climate change (GoU, 2010).

Key issues related to participatory science in community outreach for research and information dissemination policies include: inadequate disaster risk management due to impacts exacerbated by climate change; Uganda's position in international climate change negotiations which is not strong enough to effectively represent and articulate and influence global negotiations on Uganda's interests; water supply is threatened in quality and quantity due to climate change; and the inadequate integration of climate into other important sectors such as communication, energy, food security and agriculture.

Barriers to an enabling environment include:

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• Conflicting sectoral policies and legal instruments
• Conflicts of interest of the entities involved
• Media less interested in covering political issues on climate change
• Climate change is given low priority by policy and insufficient allocation of resources
• Poor information and public transparency
• Awareness of climate change challenges is low or biased
• Cooperative sharing of responsibilities and weak integration.

Participatory science in community outreach for research breaks down sub-regional barriers to climate change policy implementation. The main challenges of the national policy framework for mitigation and adaptation policy actions are: insufficient knowledge and research, integration of adaptation measures into ongoing institutional efforts, lack of exchange of knowledge and information dissemination; cross-sector and multi-stakeholder coordination and collaboration; and lack of climate resilient policy planning, budgeting and infrastructure. The Rwandan government, in collaboration with UNDP, has launched a national project titled: Supporting Integrated and Comprehensive Approaches to Climate Change Adaptation in Africa.

. Therefore, the country has embarked on the process of individual, community, institutional and national capacity building to address climate change risks and opportunities through a national project approach to adaptation and mitigation framework for the following outputs:
• Sustainable management of the environment, natural resources and land use;
• An enabling policy for effective and ecosystem-based environmental management;
• Economic productivity enhanced by environmental and natural resources;
• Capacity at national, district and community levels restored and protected vital ecosystems;
• Climate resilient policies and measures;
• Financial options for national adaptation costs have expanded to local, national, sub-regional and regional levels;
• It is established that the impact of climate change-related disaster risks has continued to worsen in the social, economic, political, environmental and natural resources of the East African Sub-region.

II- Sharing climate change information services

Strategies for the development of citizen science will help sub-regional states to remove obstacles to the planned implementation of the proposed strategic framework. Barriers include: insufficient

knowledge and research; limited integration of adaptation actions into ongoing institutional efforts, lack of knowledge exchange and information dissemination, weak coordination and collaboration among stakeholders and multiple stakeholders, and lack of planning, budgeting and establishing climate-resilient policies. As a result, the Republic of Rwanda, in collaboration with UNDP, has launched a national climate change project aimed at supporting integrated and comprehensive approaches to climate change adaptation in Africa.

The concept and practice of citizen science calls for support in achieving the project's overarching goal of developing institutional, individual, and systemic capacity to address climate change risks and opportunities through a national approach to adaptation. The following outcomes and impacts are envisaged: usable management of the environment, natural resources and land use; policy framework to support effective environmental management and ecosystem establishment; economic enhancement by using natural resources in an environmentally friendly manner; capacity at national, district and community levels to restore and protect vital ecosystems from degradation; climate policies and resilient measures; and financial options for expanded national adaptation costs at local, national, sub-regional and regional levels.

Furthermore, the threat of climate change is already manifesting in East Africa and the lack of coordinated and coherent participatory science action has severe implications. As a result, citizen science will help tackle the following vital areas: Inadequate climate change communication is a barrier to successful climate change response in Uganda; there is a lack of coordination in reporting climate change policy information in Uganda, several governmental and non-governmental bodies could serve as a central hub for climate change information, public engagement , low funding for green projects, low public profile and the development of central coordination to engage with all sectors of society. In Uganda, for example, climate change adaptation strategies were discussed through the rapid appraisal participatory research method with the target local communities and data was collected and analysed. The structured community study on semi-participatory science succeeded in classifying the areas of intervention identified (MWE, 2012) by the communities:

- **Documentation and creation of indigenous knowledge (IK);**
- **Agricultural forestry;**
- **Water resources ;**
- **Information on weather conditions and climate;**
- **Policies, legislation and planning;**
- **Land and soil management;**

- **Disaster preparedness;**
- **Other means of subsistence;**
- **Health ; And**
- **Infrastructure.**

The media in the sub-region needs more capacity building to fully engage in the coverage of scientific research activities on climate change. Training programs to help journalists and editors are essential, but civil society organizations also need to improve the way they communicate with the media, disseminate information in a clear and simple way and actively engage the public. media attention. Local languages lack terms for many key concepts involved in climate change – including "climate change" itself. Media communicators should explain climate change using terms that already exist, using graphic examples of local environmental issues and innovative communication methods to get the message across. Raising public awareness of scientific research on climate change is essential. An awareness campaign should focus on stakeholders to act on community-based climate change research.

Climate change is a major cause of hunger. All sub-regional states are classified as food insecure.

The main cause of food insecurity in the region is climate change which manifests itself in the form of extreme weather conditions such as: drought; water and pasture scarcity, crop failure, famine, rising food prices, food crisis, migration, economic loss and damage, high temperatures; an escalation of vectors (pests and diseases), crop wilting, low yields, heavy rains; crop destruction, soil erosion and leaching, contamination of water sources, livestock and crop disease, flooding; lead to an increase in crops, livestock and human disease; loss of life and livestock; destruction of crops and infrastructure, loss of crops and infrastructure, loss of crops, water pollution (GoU, 2010). , migration, economic loss. One of the challenges has been that knowledgeable researchers, policy makers or scientists are not responsible for implementing policies on the ground; and on the other hand, the local communities that are supposed to implement the guidelines, are mostly ignorant or misinformed about the policies.

III- Closing the climate reporting gap

The sub-region is vulnerable to the impacts of climate change, affecting among others, the main economic factors like water, agriculture, energy, transport, health, forestry, wildlife, land use, infrastructure and disaster risk management (CAE, 2011). Impacts include water stress and food insecurity which has diminished the potential for hydropower generation; biodiversity loss and ecosystem

degradation; increased incidence of disease burden; destruction of infrastructure; the high costs of disaster management due to the increased frequency and intensity of droughts, floods and landslides associated with El Niño phenomena in 2015. In addition, policy development under- is to fully achieve the goals of East African States; develop policies and programs aimed at strengthening and deepening cooperation. The policy was developed through a participatory approach led by experts from Burundi, Kenya, Rwanda, Tanzania and Uganda.

The elements of the East African community policy revolve around: adaptation, mitigation and research on climate change. People need capacity building; technology development and transfer; green finance; education, training and public awareness based on information and knowledge management. Gender issues are well integrated into sub-regional policy. Key adaptation priorities include: strengthening meteorological services and improving early warning systems; disaster risk management; risk reduction, preparedness, mitigation and reconstruction; increased efficient use of water and energy; irrigation; agricultural and animal production, protection of fragile ecosystems such as wetlands, coasts, marine, forestry; land use, soil; tourism; infrastructure; and the reduction of climatic infections, illnesses and diseases.

Mitigation measures include afforestation, reforestation, promotion of energy efficiency, efficiency of agricultural and animal production systems, efficiency of transport systems, waste management and renewable energy. The climate change policy aims to create, develop and maintain adaptation and mitigation capacity for all. Adaptive capacity refers to the potential or ability of a system to adapt to climate change such as climate variability and extremes, in such a way as to moderate potential damage, take advantage of opportunities or cope with adverse events. consequences (Smit, and Pitifosova, 2001). These issues affect the ability to adapt to the impacts of climate change: Wealth, Science, technology, education, institutions; information, infrastructure and social capital.

Studies indicate that the role of citizen science can limit the actual and potential negative effects of climate change. It is essential to identify relevant adaptation options, including capacity building, policy reform, integration into sector policies and project-level activities. A set of region-based criteria determined the selection of priority adaptation activities. These include (UNFCCC, 2002) the level of adverse effects of climate change; poverty reduction to build adaptive capacity; synergy with other multilateral environmental agreements; and profitability. Priority criteria are: loss of life and livelihood; human health ; food security and agriculture; water availability,

quality and accessibility; critical infrastructure; Cultural Heritage ; biological diversity; forest management and exploitation; other environmental equipment; and coastal areas and associated land loss.

The policy strategy considers that the national development policies, strategies and plans are as follows: environment, water, land, forestry, energy, transport, agriculture, livestock, fisheries, health and gender.

Tanzania and the rest of the ECA states, Burundi, Rwanda, Uganda and Kenya have developed a National Program for Adaptation Actions (NPAA), which are in various stages of implementation. The potential for climate change mitigation in the region can be achieved in particular through the energy sector by harnessing geothermal energy along the Rift Valley in East Africa, wind energy, hydroelectric, ity, solar energy, and natural gas; waste management such as methane recovery, cogeneration by the industrial and agricultural sectors.

The sub-regional treaty (ECA, 1999) calls for cooperation in environmental management, disaster preparedness, and management, protection and mitigation measures to combat natural and man-made disasters . The UNFCCC aims to stabilize GHG concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system in sufficient time to allow ecosystems to naturally adapt to climate change, ensure food security, and sustainable economic development (UNFCCC, 2005).

The objective of the sub-regional climate change policy is to coordinate climate change strategies, programs and actions in order to form a framework to harmonize, coordinate, implement initiatives to combat climate change in sub-regional states; identify priority areas for adaptation and mitigation by states and all stakeholders; promote public awareness of the socio-economic importance of climate change vulnerability, impacts, risks and interventions. Other objectives are to: promote capacity building efforts through, inter alia, education, training, research, technology development and transfer, information and knowledge management; promote climate change research and observations through model monitoring, detection, attribution and prediction to improve climate change preparedness; integration into the management of regional development planning; gender equality; and facilitate resource mobilization for the climate change policy strategy and master plan.

There are national and regional challenges and mitigation strategies that could be implemented through citizen

science engagement. The following challenges still exist;

- **Lack of financial resources to implement the mitigation measures identified in the NPAAs**
- **Weak science and engineering research capacity;**
- **Weak policy infrastructure and policy research dissemination initiatives;**
- **Ownership of mitigation measures (NAMAs);**
- **Insufficient technical capacities to develop the activities of climate change mitigation projects;**
- **Bureaucracy and high costs of CDM project development processes;**
- **Accessible database for project management, monitoring and evaluation; and**
- **Weak institutional capacities and absence of legal and regulatory frameworks for CDMs.**

Raising community awareness on participatory science for climate policies will implement the mandates of Member States to develop various instruments for climate change policy.

These instruments focus on the developed climate change strategy and master plan. Member States commit to develop country-specific policies, strategies, action plans, legislation and establish institutional arrangements to address climate change in accordance with the approved policy. The sub-regional secretariat collaborates with relevant bodies and institutions to implement sub-regional e-programmes, projects and activities. This would be done through strengthening and mobilizing the capacities of relevant existing institutions and facilities in the region to address the pressing challenges of climate change. There should be a well-structured institutional framework to plan, perform, coordinate, monitor and evaluate the implementation of citizen science community outreach.

In addition, community outreach activities can propel the effectiveness of climate policy implementation. This should lead to the following questions and options: improving technology development and transfer, including difficult technological solutions such as drip irrigation, water harvesting, drought, renewable energy technologies and building technologies; and soft technologies such as knowledge, systems, procedures and best practices; address barriers to technology transfer, including trade agreement rules, property rights and s trade barriers such as standards, eco-labelling; and improving and supporting research and development capacity to foster the development and local manufacture of cleaner production technologies to assist in climate change mitigation and building adaptive capacity should focus among others on:

- **Systematic research and observations;**

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- **Education, training and public awareness;**
- **Technology transfer and development;**
- **Information sharing, communication and knowledge management;**
- **Institutional strengthening and development;**
- **Financing climate change;**
- **Capacity building in science and engineering;**
- **Negotiations on climate change; And**
- **Construction of partnership and working network.**

IV- Dissemination of research and policy information

The role of participatory science in the monitoring and evaluation framework is essential to the success of climate policies in the sub-region. Guidelines for monitoring the implementation process include responsive mechanisms, strategy, and master plan (ECA, 2012). Similarly, the climate in Africa is diverse and controlled by complex interactions between the oceans, land and atmosphere at local, regional and global scales (ICSU, 2008). As a result, and given the fact that livelihoods are highly dependent on climate, several studies have concluded that Africa is among the continents most vulnerable to climate change with even higher temperatures and greater variability over time. future (ICSU, 2007). The continent's vulnerability is likely to increase in the future. However, the adaptive capacity of local, national and regional institutions in Africa is relatively weak in economic, human, infrastructural and informational terms. These factors, linked to governance, corruption and conflicts, aggravate the fragile situation. It would suffice to deploy a participatory scientific strategy.

As a result, Africa is grappling with economic, scientific, engineering, political and social issues with limited scientific capacity, public awareness, and finances to implement policy infrastructure. Capacity building here means providing frameworks for the identification, formulation and implementation of projects and making the best possible use of existing skills and resources. The six capacity building issues such as building human capital; strengthening research infrastructure, adequate remuneration and incentives for researchers to retain capacity; more effective communication between science and society; and the cultivation of strong links between science and policy; strengthening links between education and research, and among researchers to form a critical mass; develop national strategies for capacity building.

The participatory scientific community can eliminate the constraints encountered in capacity building such as: the integrated or cross-sectoral approach; high-level political commitment; communication difficulties between agencies, institutions, ministries, NGOs, and communities involved in the capacity building activity; data gaps and weaknesses; secure cross-border and interregional cooperation; bureaucratic systems and difficulties in identifying training opportunities; awareness-raising activities within civil society; capacity building should be integrated into overall public sector reform; specific capacity building projects are more effective when they establish policy links with other ministries such as agriculture, water, energy and finance; capacity building should involve institutional and human resource development, non-institutional capacity building should involve decision makers at the highest level; donors and host countries should adopt a long-term approach to capacity building and this requires action over time; national capacity building activities are demand-driven, and ensure the necessary support for their sustainable results.

Other factors are: lack of funding, new technologies, spare parts and know-how needed to maintain the equipment; the absence of functional institutional, political and legal frameworks to build capacity; the lack of political stability or the existence of security problems; recruitment of competent scientific personnel. The growing gap between the advancement of knowledge; scientific techniques and society's ability to understand and use them are also concerned. Knowledge gaps will require the implementation of national strategies for the development of science and technology that are linked to effective policies, and the disconnect between research and policy.

Community adaptation projects based on climate change mitigation should be household driven. A household, can be defined operationally as (Okaka, 2020): a unit of social infrastructure of human settlement, dwelling, or lodging, which normally receives or shelters individuals, relatives or non-relatives , or members of a core family which may be headed by men, women or children, as practically known in Uganda today.

In addition, capacity building for community outreach on participatory science faces key challenges in the sub-region. Gaps in knowledge, technology and capacity can be cited. With few exceptions, countries in sub-Saharan Africa lack the capacity to conduct research on man-made hazards and natural disasters, or to apply knowledge and deploy

technologies to mitigate disasters (ICSU, 2007). Research is needed on how to effectively communicate warnings of impending disasters and how to disseminate knowledge to help communities improve their resilience. The values, needs and interests of different groups and stakeholders must be taken into account. Rural communities have developed specific coping strategies. The vulnerability and resilience of the technological systems of all countries, including those in sub-Saharan Africa, depend on their energy transmission and information technology infrastructure. The level of dependency is likely to increase as African countries seek to bridge the "digital divide". Many natural hazards such as floods, earthquakes and space weather, can damage these technological systems and cause huge economic loss and damage.

Similarly, the effective transfer of community information from participatory science to decision-makers and politicians requires the establishment of a dialogue between scientists and political decision-makers. As environmental degradation is not just a technical (scientific) problem, any discussion on environmental degradation should involve decision makers and politicians. Research is needed on how to translate research findings into policies that minimize the human and economic cost of hazards, for example, in land use planning and environmental issues. There is a greater urgency to impart scientific knowledge of hazards to support early warning and preparedness. The challenge is how to provide relevant education at different levels (communities, schools, tertiary institutions) to reduce risk. A gender perspective is needed in disaster risk management policies, plans and decision-making processes, including those related to risk assessment, education and training.

Community awareness campaigns should speak directly to stakeholders at all levels and use all establishment structures to ensure understanding of early warnings of hazards and disasters. It is essential to introduce key research findings into school and tertiary curricula by developing teaching aids, for example, ICT. Interactive online learning modules should be further developed such as case histories with real data and tutorial exercises (an online module is being developed by universities in Mauritius, Malta and the Pacific South dealing with the vulnerability of islands to natural disasters). The African Virtual University in Nairobi develops teaching materials. The University of South Africa (a distance learning institution) offers a disaster management module. The University of Botswana has established a policy on virtual

centers to link climate research researchers working on environmental hazards and disasters.

Communication theories such as dissemination of theory of innovations are necessary in the dissemination of policy innovation on climate change. Dissemination theory of innovations is to sensitize target audiences to the dissemination of information (Rogers, 1962). The diffusion model identifies the problem as a lack of information whose goal (outcome) is behavior change whose solution to the lack of information on climate change is the information that the transfer has to stimulate knowledge, attitude and practice required (Rogers, 1962). The different types of interventions include social marketing, entertainment, advocacy, social networks and education, where community participation is key in priority adaptation areas like agriculture which is dominated by smallholder farmers.

To clarify the two concepts, an agriculture is the traditional or scientific method that involves the production of crops or plants, animals, or livestock, as well as fishing for subsistence or basic livelihood by a small farmer or for large-scale investment for large funds or trade by a commercial farmer; while a small farmer is a micro or small peasant (poor farmers) who practices subsistence farming or farming on a small plot of land using manual labor based on rudimentary technology mainly for the food supply of the households and for small funds in the first days of good harvest periods (Okaka, 2020).

Coordination of communication among key climate change adaptation and mitigation stakeholders should be guided by gender-focused theories, concepts or models for the empowerment of women and girls. For example, the diffusion of innovations theory studies how, why, and how quickly new ideas spread across cultures (Rogers, 1995). The relevance of innovation diffusion theory is to explain the importance of information diffusion as a prerequisite for awareness, attitude and behavior change for adoption and explain the mitigation of climate change technologies and research innovations (Okaka, 2010). At all levels of society – from ordinary citizens to farmers, media, civil society organizations and local and national governments, the need for accurate and reliable information on climate change is very high, because little is known about how to communicate climate change (Panos, 2012).

A gender equality issue has three main components: gender discrimination, gender gaps and gender oppression, and issues of access to and control of resources, benefits and opportunities. in all sectors (UN, 2015).

Gender equality issues affect the success and sustainability of development plans and programs in all sectors and in Africa. The key gender issues are: family life, employment, decision-making, education, health and agriculture. Public communication campaigns should be guided by ethical concerns, theory, and informed gender issues. The main targets and indicators of SDG number 5 on gender equality and the empowerment of all women and girls are expected to accelerate progress in Africa's regional climate change adaptation and mitigation policies . These obviously assume gender parity as elaborated in the 5th UN SDG and relevant goals (UN, 2015).

Public means must be shared about the emergence of carbon trading that provides revenue to individuals, families and businesses. Sharing knowledge about the costs and benefits of carbon trading is an essential step in accessing the financial benefits that carbon trading brings (Panos, 2012).

Accordingly, there is a need to fill policy information gaps and improve information dissemination for climate change policy to have an impact in Africa (Okaka, 2011). Most of the serious problems related to increasing vulnerabilities to climate change impacts among indigenous communities in Uganda are produced because there are still information gaps regarding the functions, values and importance of wise use. natural and environmental resources by communities, institutions and industries.

Most states in Africa still lack the basics: climate information communication services, public awareness of accessible climate information, understanding, capacity to use climate information, facilities, infrastructure and the ability or willingness to integrate climate change data into development plans. (Okaka, 2015). Similarly, climate change information is not integrated into regular media coverage or news bulletins due to low or lack of capacity or awareness, poor communication, coordination, applied research and education program (Okaka, 2015). Governments, researchers and research institutions, research networks, civil society organizations (NGOs), communities and ECA's external development partners are committed to stem from this fact. It is imperative for Africa to develop an effective regional advocacy campaign for climate change adaptation policies on the risks of climate change disasters. Africa must achieve the Sustainable Development Goals driven by ICT innovations, collaborative research, international cooperation and applied gender equality (FCCC, 2002).

Participatory scientific consultations take place at the community or household district level. Using a list of agreed criteria that best suit Tanzanian conditions and the local environment, 14 priority activities were identified. The following project activities have been ranked in order of their perceived importance in alleviating poverty: increased efficiency in crop irrigation to boost production and conservation of water areas; an alternative agricultural system and water harvesting; development of alternative water storage programs and technology for communities; community conservation initiatives and management programs; investment in renewable energies such as solar energy, biomass, hydraulic electricity, biodiesel, promotion of the use of cogeneration in the industrial sector for the loss of hydroelectric potential; a reforestation program in degraded lands using adaptive and fast-growing trees; community development of fire prevention plans; implementation of community awareness campaigns for preventive health risks; sustainable tourism development, wildlife awareness, and rural community wildlife resources; collection and recycling of water, construction of infrastructures such as: sea walls, sandy beaches, beach management system; establishing a good land tenure system and facilitating sustainable human settlements. Studies on communication strategies for energy policy makers have revealed a strong demand for radio, television, libraries, radio, books, reports, NGOs, newspapers, magazines, professional journals, Internet, colleagues, phones and reports on climate change and global warming (Okaka, 2010).

Similarly, a community-based survey of entrepreneurs' attitudes and opinions on the nature of climate change in Uganda identified the following priority concerns and issues (GoU, 2015):

- Availability of climate services
- Information sharing
- Frequency of information sharing
- Access to climate change information for planning
- Ability to interpret access to information
- Awareness of the limitations of access to information
- Conduct of climate change vulnerability assessment
- Types of information available
- Availability of climate services (weather and climate data)

• Information on soil erosion and water splashes

• Information on extreme temperature conditions (erosions, drought, landslides)

• Weather forecast information

• Information content (text, statistics, infographics, imagery, or audio visuals)

• Type of information material available

• Source of informations

V-Conclusion and recommandations

There are positive social, economic, political and environmental impacts due to the infusion of citizen science into climate change in Africa. Participatory science infusion promotes a sustainable framework for mitigating the effects of climate change in the context of public communication. The impacts of climate change have resulted in severe loss and damage to lives and livelihoods on the continent. National and sub-regional green technology policies and green financial support from international agencies will strengthen the role of citizen science in climate change adaptation and mitigation responses.

The sub-region has now developed a common policy on climate change to: integrate and coordinate major national responses to climate change; communicate effectively and promote participatory approaches; promote community-based approaches to adaptation; devote particular attention to capacity development and institutional set-ups; pay particular attention to the need for green technologies for sustainable development.

The role of citizen science influences funding mechanisms; provides a credible structure for climate information service, addresses multi-faceted issues in community outreach and ethical issues in research communication.
Participatory science promotes ICTs in climate change activities; and gender equality in political, social, economic, and environmental decision-making.

Furthermore, citizen science transcends all levels of society, from ordinary citizens to the media, from civil society organizations to researchers and governments due to the vital need for accurate and reliable information on climate change. There needs to be public awareness of the new carbon trading sector. There are gains in carbon trading for citizen revenues and in reducing GHG risks. Climate change has taken a toll on agriculture, food security, and water stress, human and animal health,

biodiversity, land and environmental degradation at the regional level.

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RIES d'ASPROBIO AGM

Revue internationale environnementale semestrielle / Biannual international environmental review

Association pour la protection de la biodiversité et adoption de gestes marqueurs

RIES -issue 1- November 2020

ISSN -in progress

Environmental protection put to the test by neonicotinoids (NNI) in France

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Summary

Are neonicotinoids an obstacle to environmental protection? Is there an environmental hazard linked to the use of neonicotinoids?

The use of neonicotinoids in France is subject to both community legislation (European Union law) and strictly French law.

But environmental imperatives do not always coincide with people's interests.

The combination of persistence (for months or years) and water solubility of neonicotinoids leads to large-scale contamination of soils, surface waters and treated (and untreated)

RIES -issue 1- November 2020

ISSN -in progress

vegetation and the accumulation in soils and sediments.

Various studies also demonstrate the toxicity of neonicotinoids. Non-chemical alternatives exist. Other natural alternatives should be valued more.

Measures are necessary on the part of the French legislator and politicians to preserve the environment against neonicotinoids.

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Introduction

Are neonicotinoids an obstacle to environmental protection? Is there an environmental hazard linked to the use of neonicotinoids?

This question raises crucial issues for the future of our planet. It arises with all the more acuity that the French Law n ° 2016-1087 of August 8, 2016 for the reconquest of biodiversity, nature and landscapes[1] will be supplemented by new derogations. Some of these exemptions relate to the use of neonicotinoids. They will be integrated following the adoption of the bill relating to the conditions for placing certain plant protection products on the market in the event of a health hazard for sugar beets.

The derogation from the 2016 law thus voted in the National Assembly on October 6, 2020 introduces an authorization for the use of neonicotinoids until July 1, 2023.

The French state, for several years, has been constantly doing an about-face in the use of

1- JORF n°0184 of August 9, 2016

neonicotinoids. Between derogations to save beets from the jaundice crisis, bans to save bees, the "neonicotinoids" waltz is far from seeing the end of the tunnel.

The French state tries as best it can to promote the protection of the environment as wishful thinking without a future, while making concessions that endanger the environment.

Environmental imperatives are not always in line with the interests of populations.

The use and effects of neonicotinoids deserve to be examined to verify compatibility with environmental requirements.

Faced with a growing concern for environmental protection, it is necessary to examine the properties of neonicotinoids (I); the legal framework governing the use of neonicotinoids in France (II); the demonstrated and recognized toxicity of neonicotinoids (III) and in the face of all these elements, make suggestions to the state authorities (IV)

I- The properties of neonicotinoids

Social actors such as environmental protection associations want a strict ban on neonicotinoids.

Efforts to protect the environment in the face of these pesticides require a thorough examination of them.

What are neonicotinoids?

Neonicotinoids are a group of chemical substances exclusively used for their insecticidal action in agriculture and for their biocidal action in domestic and professional areas[2]. These are so-called systemic insecticide substances used in agriculture to protect crops from pests, but also as biocides or veterinary drugs..[3]

In addition, neonicotinoids act on the central nervous system of insects [4]. They are synthetic analogues of nicotine with insecticidal properties [5].

Depending on their molecular structure, the following three

2- INERIS, 2015. Technical and economic data on chemical substances in France: Neonicotinoids, DRC-15-136881-07690B, p. 43 (http://www.ineris.fr/rsde/ or http://www.ineris.fr/substances/fr/)

3- ANSES's work on neonicotinoids at https://www.anses.fr/fr/content/travaux-de-l%E2%80%99anses-sur-les-n%C3%A9onicotino%C3%Afdes, mis updated on 06/11/2018.

4 - https://fr.wikipedia.org/wiki/Néonicotinoïd

5- Neonicotinoids: a threat to biodiversity, ecosystems and food security. Equiterre, Canadian Association of Physicians for the Environment. June 2018.

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subgroups of neonicotinoids are distinguished:

Nitroguanidine neonicotinoids:

• clothianidin

• dinotefuran

• imidacloprid

• imidaclothiz

• thiamethoxam

Nitromethylene neonicotinoids:

• nitenpyram

• nithiazine

Pyridylmethylamine neonicotinoids:

• acetamiprid

• cycloxapride

• imidacloprid

• nitenpyram

• paichongding

• thiacloprid [6]

These substances were first marketed between 1991 and 2002 (The Pesticide Manual, 2006). They belong to the class of systemic insecticides: i.e. after treatment, they penetrate plants (via their root or leaf systems) and are transported throughout the plant's organism (Hopwood et al., 2012). When using these substances in open fields, some neonicotinoids can degrade and give rise to metabolites.[7]

Seven neonicotinoid substances are (or have been) exploited since their introduction on the

market in the 90s: acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid and thiamethoxam[8].

Globally, sales of neonicotinoid substances account for a quarter of total insecticide sales. These tonnages are mainly dedicated to the protection of corn crops [9].

6- Neonicotinoids, on https://fytoweb.be/fr/produits-phytopharmaceuticals/usage/acteur-professionnel/neonicotinoides

7-INERIS, 2015. Données technico-économiques sur les substances chimiques en France : Néonicotinoïdes, DRC-15-136881-07690B, p. 43 (http://www.ineris.fr/rsde/ ou http://www.ineris.fr/substances/fr/)

8 - INERIS, 2015. Données technico-économiques sur les substances chimiques en France : Néonicotinoïdes, DRC-15-136881-07690B, p. 43 (http://www.ineris.fr/rsde/ ou http://www.ineris.fr/substances/fr/)

9 - INERIS, 2015. Données technico-économiques sur les substances chimiques en France : Néonicotinoïdes, DRC-15-136881-07690B, p. 43 (http://www.ineris.fr/rsde/ ou http://www.ineris.fr/substances/fr/)

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ISSN -in progress

Neonicotinoids indeed occupy a significant share of the global insecticide market.

It is therefore important to examine the legal framework for these insecticides.

II-Normative and regulatory framework for the use of neonicotinoids in France

The use of neonicotinoids in France is regulated both by European Community law (A) and by French legislation (B).

A-Community law: Law of the European Union

The following neonicotinoids are approved in the EU:

- imidacloprid
- acetamiprid

Clothianidin, thiamethoxam and thiacloprid were approved until 2019-01-31, 2019-04-30 and 2020-02-03, respectively

Approval of active substances by the EU may include various conditions and restrictions which must then be observed by Member States when authorizing products based on these substances[10].

Two texts regulate the use of neonicotinoids in Europe:

Commission Implementing Regulation (EU) No 485/2013 of 24 May 2013 amending Implementing Regulation (EU) No 540/2011 as regards the conditions for the approval of the active substances clothianidin, thiamethoxam and imidacloprid and prohibiting the use and sale of seeds treated with plant protection products containing these active substances.

TFEU, Treaty on the Functioning of the European Union.

The regulation on plant protection products was adopted based on Article 37(2), Article 95 and Article 152(4)(b) EC. These are the legal bases of the common agriculture and fisheries policy (now Article 41 TFEU), the internal market (now Article 114 TFEU) and measures in the veterinary and phytosanitary fields derogating from the common agricultural policy and having directly aimed at protecting public health [now Article 168(4)(b) TFEU].

Article 114(10) TFEU provides that the harmonization measures adopted under this

10-Néonicotinoïds ; https://fytoweb.be/fr/produits-phytopharmaceutiques/usage/utilisateur-professionnel/neonicotinoides

provision "include, in appropriate cases, a safeguard clause authorizing the Member States to take, for one or more of the non-economic reasons referred to in Article 36, interim measures subject to a Union control procedure".

According to Articles 13 and 79 of the Plant Protection Products Regulation, the Commission decides with a committee, in which the Member States are represented, on the approval of active substances.

Article 4 of the regulation on plant protection products includes criteria for the approval of active substances requiring that they have no harmful effect on the health of human beings or an unacceptable effect on the environment.

Article 6 of the Plant Protection Products Regulation allows the approval of active substances to be subject to conditions and restrictions. Articles 14 and following of the regulation on plant protection products govern the renewal of the approval of an active substance and article 21 of this regulation the review of this approval.

Pursuant to Articles 28 et seq. of the Plant Protection Products Regulation, Member States authorize on their territory plant protection products whose active substances have been approved. Article 36(3) of the Plant Protection Products Regulation empowers Member States, for risk mitigation purposes, to restrict the use of plant protection products or refuse authorisation, on grounds of concern for human or animal health or the environment.

Article 49 of the Plant Protection Products Regulation includes a special rule for placing treated seeds on the market. Under Article 49(1) of that regulation, Member States shall not prohibit the placing on the market and use of seeds treated with plant protection products authorized for that use in a Member State in less. In the event of serious concerns, the Commission may set derogations according to a procedure referred to in Article 69 of the Regulation on plant protection products. Articles 70 and 71 of this regulation also apply[11].

For the history:

- The first authorizations of neonicotinoid-based products date

11 - Conclusions de l'avocate générale Mme Juliane Kokott, présentées le 4 juin 2020. Affaire C-514/19- Union des industries de la protection des plantes contre Premier ministre e.a. (demande de décision préjudicielle formée par le Conseil d'État, France). http://curia.europa.eu/juris/document/document.jsf;jsessionid=AE37B2B6C63F2BFC35F79E0D97C6BAC7?text=&docid=226981&pageIndex=0&doclang=FR&mode=req&dir=&occ=first&part=1&cid=3220910

back to the early 1990s. Concerns had already been expressed in several European countries about their possible impact on bee health[12].

- As early as 2012, the European Food Safety Authority (EFSA) recommended undertaking a reassessment at European level of neonicotinoid active substances and changing European regulations to take greater account of the impacts of these substances on behavior[13].
- In 2013, the EFSA, seized on three neonicotinoid substances (clothianidin, imidacloprid and thiamethoxam), carried out work leading the European Commission to decide on a moratorium aimed at prohibiting the use of plant protection products based on thiamethoxam, clothianidin, imidacloprid, for certain uses, pending the re-evaluation of these active substances. This moratorium leads to a ban on seed and soil treatment for crops attractive to bees (except greenhouse crops and winter cereals), as well as a ban on foliar treatments for crops that attract bees. (with the exception of crops grown in greenhouses or after flowering).[14]

Plant protection products can only be marketed, and therefore used, if they are authorised.

Authorization takes place in two steps:

1. All active constituents (or active substances) must be approved at European level. During this approval procedure, it is assessed whether the use of this active substance does not entail unacceptable risks for humans, animals, and the environment. This is done based on a dossier with scientific studies.

Approved active substances appear on a European list: only substances that appear on this list can be used in plant protection products.

2. Only plant protection products containing an approved active substance may be authorised. These products are assessed at national level (by an EU Member State). In

12 -ANSES work on neonicotinoids; https://www.anses.fr/fr/content/travaux-de-l'anses-sur-les-néonicotinoïdes

13 -ANSES work on neonicotinoids; https://www.anses.fr/fr/content/travaux-de-l'anses-sur-les-néonicotinoïdes

14 - ANSES work on neonicotinoids; https://www.anses.fr/fr/content/travaux-de-l'anses-sur-les-néonicotinoïdes

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Belgium, the decision to authorize a product is taken on the advice of the Approval Committee (see above). The procedure is harmonised: a Member State assesses the product dossier in detail. Other Member States comment on this assessment to reach an agreement. Once an agreement is reached, a product can be marketed in the corresponding Member States.

Active substances and plant protection products are periodically reassessed. This is done in principle 10 years after the first approval, then every 15 years after the renewal of the approval. A renewal often takes place based on the adapted legislation, and therefore often according to stricter requirements. This ensures that assessments remain up to date and authorized products meet current standards.[15].

French legislation complements European regulations.

B- Law relating to neonicotinoids in France

In France, various other texts supplement European Community legislation.

Law No. 2016-1087 of August 8, 2016 for the recovery of biodiversity, nature and landscapes regulates in some articles the use of neonicotinoids.

Paragraph 2 of article 125 is quite explicit. It prohibits the use of plant protection products containing one or more active substances from the neonicotinoid family and seeds treated with these products from 1 September 2018.

"II. – The use of plant protection products containing one or more active substances from the neonicotinoid family and of seeds treated with these products is prohibited from 1 September 2018. "Derogations from the prohibition mentioned in the first paragraph of this II may be granted until July 1, 2020 by joint order of the ministers responsible for agriculture, the environment and health. "The decree mentioned in the second paragraph of this II is taken on the basis of a report drawn up by the National Agency for Food, Environmental and Occupational Health Safety which compares the benefits and risks associated with uses of plant protection products containing active substances from the neonicotinoid family authorized in France with those related to the use of substitute products or alternative methods available. "This report covers the impacts on the environment, on pollinators, on public health and on agricultural activity. It is made public under the conditions provided for in the last paragraph of Article L. 1313-3 of the Public

15-Néonicotinoïds, https://fytoweb.be/fr/produits-phytopharmaceutiques/usage/produits-phytopharmaceutiques/la-procedure-dautorisation-en

Health Code. »II. – The last paragraph of II of Article L. 254-7 of the same code, in its wording resulting from law no. 2015-992 of 17 August 2015 relating to energy transition for green growth, is amended as follows: 1° The words: "and des" are replaced by the word: "des"; 2° After the words: "Council 91/414/EC", are inserted the words: "and products whose use is authorized in the context of organic farming".

Decree No. 2018-675 of July 30, 2018 complements it. It relates to the definition of active substances of the neonicotinoid family present in phytopharmaceutics products.

This decree describes the list of substances from the neonicotinoid family mentioned in article L. 253-8 of the rural and maritime fishing code.

The bill of October 6, 2020 relates to the conditions for placing certain plant protection products on the market in the event of a health hazard for sugar beets and provides new exemptions for the use of neonicotinoids.

III- The toxicity of neonicotinoids demonstrated

The persistence of neonicotinoids in the environment deserves to be examined (A), before highlighting the recognized negative effects (B).

A-Environmental persistence of neonicotinoids

The Worldwide Integrated Assessment (WIA) undertaken by the Task Force on Systemic Pesticides (TFSP) has provided a comprehensive and independent analysis of these chemicals and their impacts on ecosystems and biodiversity, in order to provide information on the measures to be taken. Bringing together all that is known and published, this assessment consisted of the analysis of nearly 1,000 studies by around thirty researchers from around the world in the various disciplinary fields concerned, from biology to physics, chemistry, and toxicology.

The conclusions are: neonicotinoids are persistent - especially in soils - for months and, in some cases, for years when they accumulate. This increases their toxic impacts by increasing the duration of exposure of non-target species (mainly soil invertebrates). Metabolites of neonicotinoids (compounds resulting from their breakdown) are often as toxic, or even more, than the active substances.[16]

16-Néonicotinoïds and impacts on environment, https://www.fnab.org/images/files/actualites/COMMUN_NeonicotinoidesEtEnvironnement_042016_Vdef.pdf

The table below highlights the environmental persistence of neonicotinoids.

active ingredient	Hydrosolubility (mg/l)	Half-life, aerobic soils (j)a	Half-life, plant tissues (j)a
Acétamiprride	2950	3	15,4
Clothianidine	340	545	16,6
Dinotéfurane	39830	82	6,8
Imidaclopride	610	191	4,9
Nitenpyrame	590000	8	ND
Thiaclopride	184	18	3,8
Thiaméthoxame	4100	121	4,4

Table: Water solubility and environmental persistence of neonicotinoids [17].

The combination of persistence (for months or years) and water solubility leads to large scale contamination of soils, surface waters and treated (and untreated) vegetation and accumulation in soils and sediments. There is strong evidence that soils, waterways, and plants in agricultural, urban and drainage areas are contaminated in widely varying environmental concentrations by mixtures of neonicotinoids and their metabolites. For the aquatic environment, it is the aquatic invertebrates, at the base of the food chain, which are the most impacted.[18]

Properties can be very different from each other.

Active Substance	Clothianidine	Acétamiprride
LD50 acute	0,0258 µg/bee	9,26 µg/bee

17--Pesticide Properties Database (PPDB). University of Hertfordshire. Accessible at sitem.herts.ac.uk/aeru/ppdb/en/index.htm at: Neonicotinoids: a threat to biodiversity, ecosystems and food security. Equiterre, Canadian Association of Physicians for the Environment. June 2018.

18-Neonicotinoïds and impacts on environment https://www.fnab.org/images/files/actualites/COMMUN_NeonicotinoidesEtEnvironnement_042016_Vdef.pdf

contact toxicity		
LD50 acute oral toxicity	0,00379 µg/bee	8,85 µg/bee
Chronic toxicity (10 days)	LDD50 :0,00095 µg/bee/day	LDD50 : 11,7 µg/bee/day

Tableau : Comparison of the toxicity of clothianidin for bees with that of acetamiprid

The LD50 indicates the amount of substance in a test that leads to 50% mortality after exposure to a dose (= acute toxicity), either by contact or by oral ingestion. Thus, the lower the value mentioned in the table, the more toxic the substance. It is clear that clothianidin is much more toxic to bees than acetamiprid, approximately 359 times more toxic by contact (9.26: 0.0258 = 359) and 2335 times more toxic orally (8.85: 0.00379).

For the determination of chronic toxicity, the substance is administered for 10 days. The conclusion is the same: clothianidin is much more toxic for bees, also in case of chronic administration..[19]

This toxicity is only part of the recognized negative effects of Neonicotinoids.

B-Recognized negative effects

Tsvetkov et al. demonstrated that in Canada, in corn production areas, honeybees were exposed to neonicotinoids for four months, corresponding to the majority of their activity period, at significant levels despite the obligation imposed on farmers to use lubricants to reduce emissions of dust contaminated with pesticides. They also demonstrated that these molecules, at field doses, had many worrying negative effects for honeybee colonies, explaining their weakening, and ultimately their decline: an early mortality of foragers 23% higher than that of uncontaminated colonies, a propensity to swarm combined with difficulty in rearing a new queen reducing the effective spawning time and a loss over time of the hygienic capacity of the colony. Finally, the scientists established that in the presence of boscalid (a common fungicide used in particular in association with certain insecticides), the toxicity of two neonicotinoids, clorthianidin and thiamothoxam, was almost doubled.[20].

19- Neonicotinoids, https://fytoweb.be/en/phytopharmaceutical-products/usage/professional-user/neonicotinoids.

20- Neonicotinoids: new scientific knowledge on their impact on bees. Foundation for research on Biodiversity.

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By conducting several field studies in Hungary, Germany and the United Kingdom to assess the effects of neonicotinoid insecticides on three species of pollinators, Woodcock et al. have, for their part, demonstrated that exposure to neonicotinoids has mainly negative effects on the interannual reproductive potential of the insects studied and that even if the levels of exposure to neonicotinoids are low, they cause sublethal impacts likely to decrease survival long-term populations. Negative effects associated with clothianidin treatment were observed in workers of Apis mellifera, Hungary, leading to smaller colonies the following spring with a decline rate of 24%. As for the wild species Bombus terrestris and Osmia bicornis, the authors demonstrated that exposure to neonicotinoid residues, mainly those stored in nests and resulting from generalized environmental contamination, reduced queen production for the former and queen production for the latter. of eggs. These different impacts altering the reproductive success of populations of domestic or wild pollinators reduce the ability of these species to establish new populations from year to year and could explain their declines, currently widely documented. Furthermore, the results obtained in three different countries demonstrate the importance of specific and local factors which probably explain the discordant results of previous studies conducted in a single country or on a reduced number of sites.[21].

IV- Suggestions to state authorities

It is recurrent that French politicians and legislators rely on comfort solutions. These makeshift solutions do not necessarily correspond to the imperatives of environmental protection.

The demonstrated negative effects of neonicotinoids should perhaps lead French legislators and politicians to reconsider the use of neonicotinoids in a comprehensive manner.

Methods and alternatives that do not use synthetic chemistry exist as alternatives to the use of neonicotinoids.

In field crops:

https://www.fondationbiodiversite.fr/neonicotinoides-des-nouvelles-connaissances-scientifiques-sur-leur-impact-sur-les-abeilles/

21 - Néonicotinoïdes : des nouvelles connaissances scientifiques sur leur impact sur les abeilles. Fondation pour la recherche sur la Biodiversité. https://www.fondationbiodiversite.fr/neonicotinoides-des-nouvelles-connaissances-scientifiques-sur-leur-impact-sur-les-abeilles/

Winter cereals (wheat, barley, rye, sorghum)

-Avoid sowing too early (before October 15) which promotes the development of aphids, vectors of viruses

- If the presence of aphids is beyond the thresholds defined in the plant health bulletins, treat, sif necessary, with simple pyrethrins, which are less expensive than neonicotinoid treatments and have less negative impact on the environment.

Against wireworm: - Carry out tillage to disrupt their development cycles, by bringing the larvae to the surface to cause them to dry out - Increase the seeding density - Introduce into the rotation crops that are not very sensitive to this pest and which limit the laying of eggs (crucifers, peas, beans).

Corn: -Avoid sowing too early when the ground is too cold -Avoid monoculture which promotes the development of various insects (wireworm, corn rootworm, etc.). Against wireworm: alternate crops, plant quick-start maize varieties, adapting the earliness of the variety to the pedoclimatic zone, if necessary, use localized starter fertilizers. Against the leaf beetle: practice crop rotations, or even biological control with nematodes Against the corn borer: the use of trichogramma (a parasitic wasp of the corn borer) is a simple, reliable and effective method of control.

Beets: Using neonicotinoid-treated beet seed allows farmers to go unchecked for insect attacks for several months. This is why some farmers consider this type of pesticide as a "comfort solution". However, the implementation of simple recommendations makes it possible not to use neonicotinoids while controlling the main pest attacks.

Against aphids: - Do not sow too early in cold soil, thus promoting rapid growth of beets and reducing the impact of attacks by aphids, vectors of viral infections (jaundice). Due to cluster development, aphid damage to beet yield is localized and often limited. -Observe the crop and use, if necessary, a simple pyrethrin-A key point: aphids are generally regulated naturally if there is a minimum of biodiversity (hoverflies, ladybirds, lacewings), a condition incompatible with use neonicotinoids. Any losses will be compensated by the savings made by purchasing seeds without neonicotinoids. Against the wireworm: - Carry out tillage to disturb its development cycle, by bringing the larvae to the surface to cause them to dry out. - Some natural fertilizers can be used to fight indirectly against soil insects, such as castor cake (insecticide and nematicide properties).

Rapeseed: The use of neonicotinoids is in the vast majority of cases useless because it does not respond to any technical impasse. This use is on the other hand very dangerous

for auxiliary insects (rapeseed is a plant much visited by pollinating insects).

Potato: Against wireworms, several possibilities depending on the conditions and the level of risk: - certain varieties of mustards used in green manures - stubble cultivation - plant manure, the best known of which against wireworms is that of fern - cakes castor oil. Colorado potato beetles are very well managed with Bacillus thuringiensis subsp. Tenebrionis.

For arboriculture:

Five major families of non-"chemical" alternatives:

•Chemical mediators (mating confusion - pheromones)

•Physical protection (anti-insect nets)

•The use of micro-organisms (example bacillus thuringiensis -Bt)

•Recourse to macro-organisms (predation - parasitism by auxiliaries)

•Natural substances (essential oils, natural elicitors, plant extracts, etc.)

Biodiversity plays an important role in crop protection. It is also important to have a good knowledge of the functioning of the tree, the control of its vigor, through knowledge of the soil and varietal sensitivities.

Against aphids: -Problems occur with varieties put on the market despite their sensitivity to aphids, with practices that weaken the plant and with an excess of nitrogen (mineral) qu

Conclusion

Highlighting the issues raised by neonicotinoids and the dangers they represent for the environment shows some of the challenges facing the environment in France.

Modestly, this article has attempted to unveil the overall contours of neonicotinoids.

Rethinking the use of neonicotinoids through the prism of protecting the environment and safeguarding future generations is an absolute emergency.

This requires revisiting not only its use, but also the legal principles that govern its use.

Currently being put to the test by neonicotinoids, environmental protection might hold its revenge and in turn put neonicotinoids to the test.

It is our environment, it is our common home. Our survival depends on it.

RIES -issue 1- November 2020

ISSN -in progress

RIES -issue 1- November 2020
ISSN -in progress

Revue internationale environnementale semestrielle / Biannual international environmental review

Association pour la protection de la biodiversité et adoption de gestes marqueurs

RIES -issue 1- November 2020